GPM Ground Validation Dual-frequency Dual-polarized Doppler Radar (D3R) IPHEx

Introduction

The GPM Ground Validation Dual-frequency Dual-polarized Doppler Radar (D3R) IPHEx data set contains radar reflectivity and doppler velocity measurements. The D3R was developed by a government-industry-academic consortium with funding from NASA's Global Precipitation Measurement (GPM) Project. It operates at the ku (13.91 GHz ± 25 MHz) and ku (35.56 GHz ± 25 MHz) frequencies covering a fixed range from 450 m to 39.75 km.

Citation

Chandrasekar, V. 2016. GPM Ground Validation Dual-frequency Dual-polarized Doppler Radar (D3R) IPHEx [indicate subset used]. Dataset available online [https://fcportal.nsstc.nasa.gov/pub/gpm_validation/iphex/D3R/] from the NASA EOSDIS Global Hydrology Resource Center Distributed Active Archive Center, Huntsville, Alabama, U.S.A. doi: https://dx.doi.org/10.5067/GPMGV/IPHEX/D3R/DATA101

Keywords:

Radar reflectivity; doppler velocity; precipitation; dual-polarized doppler radar

Campaign

The GPM Integrated Precipitation and Hydrology Experiment (IPHEx) was held in North Carolina during the months of April-June 2014. The goal of IPHEx was to characterize warm season orographic precipitation regimes and the relationship between precipitation regimes and hydrologic processes in regions of complex terrain. The IPHEx campaign was part of the development, evaluation, and improvement of remote-sensing precipitation algorithms in support of the GPM mission through NASA GPM GV field campaign (IPHEX_GVFC) and the evaluation of Quantitative Precipitation Estimation (QPE) products for hydrologic forecasting and water resource applications in the Upper Tennessee,

Catawba-Santee, Yadkin-Pee Dee, and Savannah river basins (IPHEX-HAP, H4SE). NOAA Hydrometeorology Testbed (HTM) has synergy with this project. More information about IPHEx is available at http://gpm.nsstc.nasa.gov/iphex/.

Instrument Description

The Dual-frequency Dual-polarized Doppler Radar (D3R), developed with funding from NASA's Global Precipitation Measurement (GPM) Project, is a fully polarimetric, scanning weather radar system which provides estimations of hydrometeor classification and drop size distribution retrievals. The first generation D3R design comprises of two separate co-aligned single-frequency antenna units mounted on a common pedestal with a dual-frequency dual-polarized solid- state transmitter. The D3R operates at the ku (13.91 GHz ± 25 MHz) and ka (35.56 GHz ± 25 MHz) frequencies covering a fixed range from 450 m to 39.75 km. These frequencies where selected for close compatibility with the GPM Dual-frequency Precipitation Radar (DPR) instrument onboard the GPM Core Observatory satellite.

More detailed information on the Dual-frequency Dual-polarized Doppler Radar can be found at:
- http://ghrc.nsstc.nasa.gov/uso/ds_docs/gpmgv/d3r/PMM_D3R.pdf
- http://ghrc.nsstc.nasa.gov/uso/ds_docs/gpmgv/d3r/Chandra_D3R_igarss_2010.pdf
- http://ghrc.nsstc.nasa.gov/uso/ds_docs/gpmgv/d3r/Vega_D3R_igarss_2010.pdf.

The GPM requirements document for Mobile Ka-/Ku-band Radar is available at http://ghrc.nsstc.nasa.gov/uso/ds_docs/gpmgv/d3r/GVS_KaKu_Radar_dex.pdf.

Investigators

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File Naming Convention

The D3R IPHEx data set files are named with the following convention:

Data: iphex_d3r_[freq]_YYYYMMDD_HHMMSS_##.nc
Browse: iphex_d3r_[freq]_YYYYMMDD_HHMMSS_##_ppi_#.#el_zdb.png

Table 1: File naming convention variables

Variable	Description
iphex	field campaign
d3r	Dual-frequency Dual-polarized Doppler Radar
[freq]	frequencies, ka or ku (13.91 GHz ± 25 MHz and 35.56 GHz ± 25 MHz, respectively)
YYYY	Four-digit year of the data

MM	Two-digit month of the data
DD	Two-digit day of the data
HHMMSS	Time of day (UTC) of data. Two digit hour, month and second
##	Scan number within volume
ppi	Plan position indicator scan mode
#.#el	Elevation angle
zbd	Reflectivity
.nc	NetCDF file format
.png	Portable network graphic image file format

Data Format Description

The GPM Ground Validation D3R IPHEx data are available in netCDF format with a data processing level of 1B. More information about NASA data processing levels can be found at http://science.nasa.gov/earth-science/earth-science-data/data-processing-levels-for-eosdis-data-products/.

Table 2: Data Characteristics

Characteristic	Description
Platform	Ground station
Instrument	Dual-polarized Doppler Radar (D3R)
Spatial Coverage	N: 35.6, S: 35.2, E: 82.0, W: 83.1 (North Carolina, United States)
Spatial Resolution	405m to ~40km (39.75km)
Temporal Coverage	Start date: 05-01-2014 Stop date: 06-15-2015
Temporal Resolution	Daily, 1 scale per file
Parameter	Radar reflectivity, radar velocity
Processing Level	Level 1B

Data Parameters

Each data file contains several data fields. Please refer to Table 3 for information on the primary data fields within each file.

Table 3. Primary D3R Data Fields

Field Name	Type	Unit
Azimuth	Double	Degrees
CopolarCorrelation	Float	Unitless
DifferentialPhase	Float	Degrees
DifferentialReflectivity	Float	dB
Elevation	Double	Degrees
PolarizationMode	Integer	Unitless
Reflectivity	Float	dBZ
ReflectivityHV	Float	dBZ
ReflectivityV	Float	dBZ
Velocity	Float	$m\ s^{-1}$

References

Chandrasekar, V., Schwaller, Mathew R., Vega, Manuel, Carswell, James R., Mishra, Kumar Vijay, Meneghini, Robert and Nguyen, Cuong . "Scientific and engineering overview of the NASA Dual-Frequency Dual-Polarized Doppler Radar (D3R) system for GPM Ground Validation." Paper presented at the meeting of the IGARSS, 2010. doi: 10.1109/IGARSS.2010.5649440

Vega, Manuel, Carswell, James R., Chandrasekar, V., Schwaller, Mathew R. and Mishra, Kumar Vijay. "Realization of the NASA Dual-Frequency Dual-Polarized Doppler Radar (D3R)." Paper presented at the meeting of the IGARSS, 2010. doi: 10.1109/IGARSS.2010.5653929

Contact Information

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